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Marketing Cannery Tomatoes on Grade in Ohio

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OHIO
AGRICULTURAL EXPERIMENT STATION
Wooster, Ohio

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PREFACE

Purchase of raw stock requirements by manufacturers on the basis of standards promulgated by the United States Department of Agriculture is a recent development in the fruit and vegetable canning industry. Grades for cannery tomatoes were the first canning crop standards issued by the federal department. These appeared as tentative standards in 1923. After some revisions these grades have been adopted at a gradually increasing number of canning factories in many states. Their use is optional with manufacturers.

United States grades for cannery tomatoes were used for the first time on a commercial scale by five Ohio canners in 1930. The practice was continued and expanded in 1931; in that year twelve canners in Ohio purchased their raw stock requirements from growers on the basis of these grades.

Substitution of quality and price gradations for previous flat rates in growers' contracts has presented several problems, of which one at least has not yet been thoroughly studied. Equitable relationship in prices paid for the acceptable grades depends largely upon the quantity and quality of the finished products that may be packed from each grade. Adequate information on this point was not available, and, as a result, contract prices for graded tomatoes have shown wide variations. It has been the primary object of the present study to develop data bearing on this question.

The author wishes to acknowledge gratefully the assistance of all those who contributed to this study. Detailed information concerning inspection and grading in Ohio in 1930 and 1931 was furnished by Mr. M. W. Baker, supervising inspector of the United States Bureau of Agricultural Economics and the Ohio Division of Markets. Certain other data employed in the manuscript were secured with the assistance of Mr. Baker. The following canning companies generously revealed certain information regarding their operations, without which this study would not have been possible: The Beckman and Gast Canning Company, St. Henry; the Gypsum Canning Company, Port Clinton; the McCoy Canned Food Company, Urbana and New Carlisle; and the Tip Top Canning Company, Tippecanoe City. Some of the data were furnished by Mr. O. L. Teagarden of the J. Weller Company, Oak Harbor; by Mr. Howard A. Orr of the Winorr Canning Company, Circleville; by Mr. Banks

Collings of the Crampton Canneries, Celina; by Mr. C. G. Woodbury of the National Canners Association, Washington, D. C.; by Mr. A. I. Judge of the Canning Trade, Baltimore, Maryland; by Mr. R. L. Perin of the Continental Can Company, Cincinnati; and by Mr. J. M. Paver of the F. L. Dutton Company, Columbus. Sample cans of tomatoes were graded by Mr. Paul M. Williams of the United States Bureau of Agricultural Economics, Washington, D. C.

Especial thanks are due to Mr. George S. Wenger and Mr. Lawrence Satterfield of the Gypsum Canning Company for their generous cooperation in the experimental work reported herein.

MARKETING CANNERY TOMATOES ON GRADE IN OHIO

CHAS. W. HAUCK

The manufacture of canned tomatoes and tomato products is an important industry in Ohio. From an average annual pack of 134,000 cases[1] of tomatoes in the years 1891 to 1895, the output increased to an average annual pack of 203,000 cases[1] in the years 1926 to 1930. During the latter 5 years the area planted to tomatoes for manufacture in this State averaged 10,350 acres annually, and production averaged 52,660 tons, with an average farm value of $625,000.

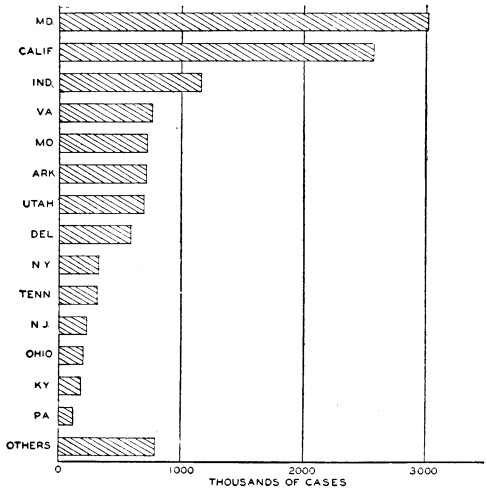

Fig. 1.—Tomatoes packed in the United States, 5-year average, 1926-1930. Ohio ranks twelfth in production of canned tomatoes.

Based on the number of cases packed during the period 1926 to 1930, inclusive, Ohio ranked twelfth among the states, being preceded by Maryland, California, Indiana, Virginia, Missouri, Arkansas, Utah, Delaware, New York, Tennessee, and New Jersey, named in the order of importance. Although some increase has occurred

[1] 24 No. 3 cans to each case. National Canners Association. Figures are not available to show the pack of other tomato products.

in the production of canned tomatoes in Ohio since 1891, the earliest year for which records are available, the State's relative position has declined. In the 1890's Ohio ranked fifth to ninth.

In 1931 thirty companies were engaged in the manufacture of canned tomatoes, tomato pulp, puree, tomato juice, catsup, or chili sauce in Ohio. The industry provides many farmers with market outlets of importance.

TABLE 1.—Tomatoes for Manufacture in Ohio, 1919-1931*

Year	Acres planted	Tons produced	Farm value
1919	7,100	42,600	$703,000
1920	7,690	46,100	730,000
1921	4,470	24,600	271,000
1922	11,360	59,100	650,000
1923	13,860	63,800	748,000
1924	9,000	48,600	562,000
1925	8,560	51,400	673,000
1926	8,000	38,400	430,000
1927	10,000	45,000	560,000
1928	10,400	60,300	699,000
1929	10,950	52,600	631,000
1930	12,400	67,000	804,000
1931	10,300	61,800	599,000
Average	9,545	50,869	620,000

**Crops and Markets*, United States Department Agriculture.

TABLE 2.—Tomatoes Packed in the United States, 1926-1930*

State	Number of cases packed†					
	1926	1927	1928	1929	1930	5-year average
Maryland	1,901,000	3,670,666	1,720,371	4,050,160	3,769,564	3,022,352
California	2,347,000	2,256,874	1,991,022	2,811,550	3,460,162	2,573,321
Indiana	900,000	1,131,254	613,037	1,134,181	2,028,943	1,161,483
Virginia	572,000	1,058,634	465,755	918,475	818,494	766,672
Missouri	895,000	605,029	395,908	621,613	1,120,016	727,513
Arkansas	558,000	677,914	613,065	768,643	1,008,307	725,186
Utah	235,000	792,264	923,727	767,633	788,309	701,387
Delaware	228,000	827,466	324,876	851,238	754,864	597,289
New York	302,000	299,820	261,369	328,957	466,681	331,765
Tennessee	280,000	368,380	159,618	297,114	518,327	324,688
New Jersey	204,000	253,692	94,543	256,523	355,598	232,871
Ohio	120,000	188,705	124,322	153,343	428,976	203,069
Kentucky	223,000	252,605	111,400	166,570	161,108	182,937
Pennsylvania	118,000	166,888	94,909	121,953	150,680	130,486
All others	572,000	586,851	645,060	897,348	1,167,770	773,806
Total	9,455,000	13,137,042	8,538,982	14,145,301	16,997,799	12,454,825

*National Canners Association.
†24 No. 3 cans per case.

USE OF UNITED STATES GRADES

United States grades for cannery tomatoes are not compulsory; they may be employed at the option of the manufacturer. They were used on a commercial scale by Ohio canners for the first time in 1930. In that year five tomato canners in this State, operating six

factories and one receiving station, purchased raw stock from growers on the basis of these standards. Approximately 9100 tons of tomatoes were received at these seven stations that season. Grades were determined by government inspection[2] and returns to growers were based on the proportionate amounts of each grade in the samples examined by the inspectors. Results were gratifying to canners and growers, many of whom enthusiastically endorsed the purchase of tomatoes on a graded basis, and the practice was continued by these canning companies in 1931.[3] Other companies also adopted federal grades and government inspection as the basis for their contracts with producers in 1931, so that in that year 12 companies in Ohio, operating 14 factories, purchased 18,088 tons of tomatoes on this plan.

Prior to the adoption of federal grades and inspection it was customary for canners to buy their raw stock requirements from growers at a flat price per ton, these agreements being entered into in advance of planting. Almost without exception, contracts specified delivery of sound, red ripe tomatoes, without provision for acceptance of poorer tomatoes under any circumstances. The canner usually reserved the privilege of rejecting deliveries that failed to meet these specifications or of "docking" returns to the grower in proportion to the amount of unacceptable tomatoes delivered, although these terms rarely appeared in contracts. The canner was the final judge of the acceptability of the tomatoes delivered.

In actual practice canners often accepted tomatoes that failed to meet contract requirements. Interpretation of the terms "sound and red ripe" was not always constant. When the crop was large, it was natural for the buyer to become more critical of the quality and maturity of the tomatoes delivered by the growers; whereas, when the yield was small and the canner found it difficult to secure enough tomatoes to meet his requirements, he might overlook inferior deliveries. Acceptance of poor tomatoes at one time and insistence on high quality at another tended to destroy confidence, and business relationships suffered. Payment of all growers at the same rate per ton regardless of the quality delivered likewise tended to discourage the better growers and resulted in indifferent harvesting and handling. The growers' principal objective became large tonnage, without regard to quality or maturity beyond the minimum of acceptability to the buyer.

[2]Inspection was provided by joint action of the United States Bureau of Agricultural Economics and the Ohio Division of Markets.

[3]Except one factory and one receiving station that were not operated in 1931.

Canners constantly faced a difficult task in attempting to maintain quality. Poor tomatoes in the yard meant either poor tomatoes in the can or excessive wastage with unreasonably high packing costs. Usually it meant both. Consequently, manufacturers looked with favor upon any proposal that gave promise of improving the quality of their raw material. Many manufacturers, moreover, recognized an unfairness to the better growers in the flat rate system of buying and were ready to adopt grading and inspection as soon as the practicability of the plan was demonstrated. Successful use of this system in other states, therefore, was soon followed by its adoption by leading canners in Ohio. The practice seems destined to grow.

UNITED STATES GRADES FOR CANNERY TOMATOES

The United States Bureau of Agricultural Economics promulgated the first tentative federal standards for cannery tomatoes in 1923. Since that time some revisions have been made in these standards. The specifications of the grades in use in 1930 and 1931 are as follows:

GRADES

"U. S. No. 1 shall consist of tomatoes which are firm, ripe, well colored, well formed; free from molds and decay and from damage caused by growth cracks, worm holes, catfaces, sunscald, freezing injury, or mechanical or other means. (See minimum size).

"U. S. No. 2 shall consist of tomatoes which do not meet the requirements of the foregoing grade, but which are ripe and fairly well colored and which are free from serious damage from any cause. (See minimum size).

"Culls are tomatoes which do not meet the requirements of the foregoing grades."

MINIMUM SIZE

"The minimum size may be fixed by agreement between buyer and seller. Tomatoes below this specified minimum size shall be classed as Culls."

DEFINITIONS OF TERMS

"As used in these grades:

'Firm' means that the tomato is not soft, puffy, shriveled or water soaked.

'Well colored' means that the tomato shows at least 90% good red color.

'Fairly well colored' means that the tomato shows at least two-thirds good red color.

'Well formed' means that the tomato shall not be extremely flat or otherwise badly misshapen.

'Damage' means any injury which cannot be removed in the ordinary process of trimming and peeling without a loss of more than 10% (by weight) of the tomato in excess of that which would occur if the tomato were perfect.

'Serious damage' means any injury which cannot be removed in the ordinary process of trimming and peeling without a loss of more than 20% (by weight) of the tomato in excess of that which would occur if the tomato were perfect."

It is not intended that the grower sort the tomatoes into No. 1 and No. 2 grades. The only grading required of the grower is the removal of culls. Such tomatoes are of little or no commercial value, cannot be used economically by the canner, and should be left in the field.

These standards provide a basis for sampling deliveries as they arrive at the cannery. Inspection of these deliveries is necessary to determine the amounts of each grade in each load of tomatoes. Inspectors must be capable of judging quickly and accurately the samples selected from each load, must sort the samples into the various grades, and determine the percentages of U. S. No. 1, U. S. No. 2, and culls. They must be absolutely fair and neutral. Most canners using the United States grades have preferred to employ official government inspectors rather than their own private employees in order to insure efficiency and fairness in this important function. These inspectors are employed, trained, and constantly supervised by the Federal-State Food Products Inspection Service and are stationed at canneries where and when needed. During the period of their employment the manufacturers using this service pay to the State Department of Agriculture an amount sufficient to cover the salaries and expenses of the inspectors. They are then paid by the Department from this fund.

THE INSPECTION PROCESS

Sample containers are selected by the inspector or his assistant from each load of tomatoes as it arrives at the plant. The number of containers taken as samples depends upon the size of the load and the degree of variation apparent in the quality and condition of the tomatoes. The sample usually consists of about 100 pounds or more. These sample tomatoes then are emptied onto a specially designed grading table and are sorted into U. S. No. 1's, U. S. No. 2's, and culls, each grade being placed in a separate compartment of the table, Figure 2. After sorting of the sample has been completed, the table is tipped to allow all three compartments to empty simultaneously into containers resting upon small platform scales with horizontal dials. The weight of each grade is copied directly on the inspection certificate, and, by means of a computation table, the percentages are readily determined and recorded.

A certificate is made out for each load, showing the weights and percentages of each grade in the inspector's sample. For the convenience of the canner and grower, space is provided for recording the gross and net weight of the load, the weight of each grade

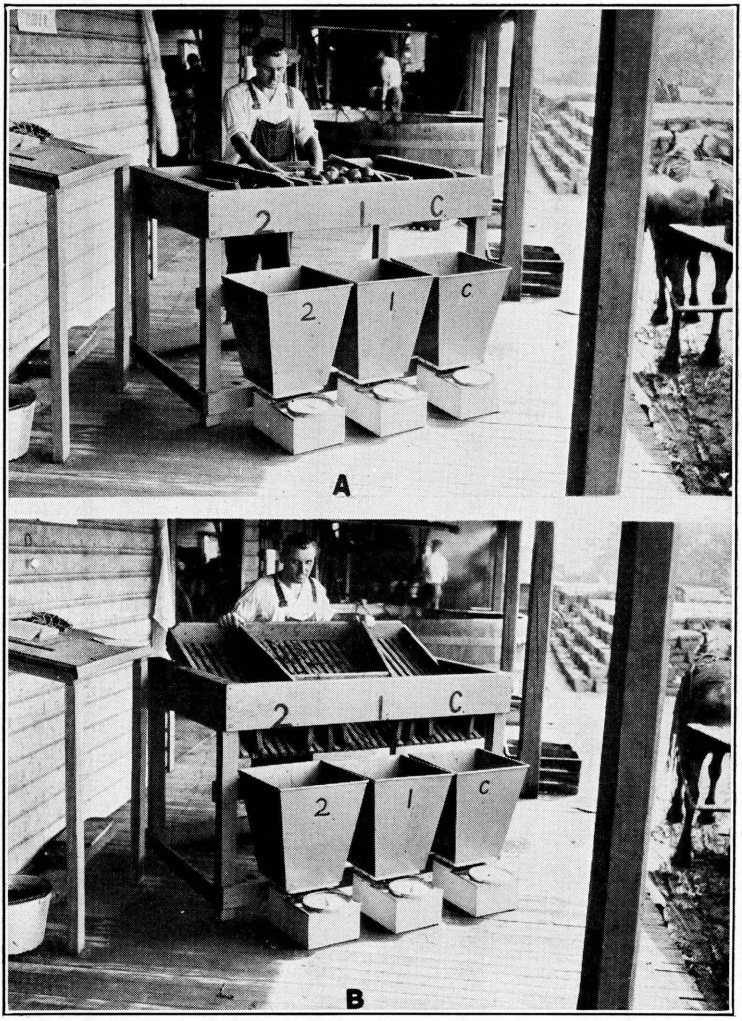

Fig. 2.—Inspection table. Grades are determined by licensed government inspectors at time of delivery

calculated by applying the inspector's percentages to the net weight, the value of each grade calculated by applying the appropriate contract price to the weight, and the resulting total value of the load. The certificate is issued in triplicate, one copy going to the canner, one to the grower, and one to the inspection files. A sample certificate is illustrated in Figure 3.

UNITED STATES DEPARTMENT OF AGRICULTURE
OHIO STATE DEPARTMENT OF AGRICULTURE, COOPERATING
INSPECTION CERTIFICATE

No. 111

This certificate is issued pursuant to the Act making appropriation for the United States Department of Agriculture and is receivable as prima facie evidence in all courts of the United States.

Inspection Point Port Clinton, O. Date Aug. 22, 1930 Hour 9:00 A.M.
Canner Gypsum Canning Co. Grower John Doe
Products Inspected Tomatoes No. of Containers 100
(Grower's Count)

I, the undersigned, on the date above specified, made personal inspection of samples believed by me to be representative of the lot herein described, and do hereby certify that the conditions at the said time and on the said date as shown by said samples were as stated herein.

	POUNDS			
	Samples	U. S. No. 1	U. S. No. 2	Culls
	100	75	24	1
Percent		75	24	1

Neil Hanson
Inspector.

The information below is for the convenience of the canner and its accuracy is not vouched for by the inspector.

Gross Wt.	3000 Lbs.	1500	Lbs. U. S. No. 1 @ $	14.00	$ 10.50
Tare	1000 Lbs.	480	Lbs. U. S. No. 2 @ $	12.00	$ 2.88
Net	2000 Lbs.	20	Lbs. Culls		
			Value of Total Load $		13.38

ORIGINAL

Fig. 3.—Inspection certificate. Inspectors isssue a certificate on each lot examined

GRADING IN 1930 AND 1931

Summarization of the inspection certificates issued in Ohio reveals that, at the seven stations where the work was carried on in 1930, deliveries totalled 18,196,761 pounds of tomatoes, and at 14 stations in 1931 they totalled 36,176,045 pounds. Samples selected for inspection in 1930 graded as follows: U. S. No. 1, 54.3 per cent; U. S. No. 2, 38.9 per cent; and culls, 6.8 per cent. In 1931 samples graded 51.7 per cent No. 1's; 35.6 per cent No. 2's; and 12.7 per cent culls.[4] The volume delivered and percentages of each grade are shown for each factory in Table 3.

[4]Growing conditions were less favorable in 1931 than in 1930.

TABLE 3.—Cannery Tomatoes Purchased Under Inspection in Ohio, 1930 and 1931

Station	Percentage			Pounds delivered			
	U. S. No. 1	U. S. No. 2	Culls	U. S. No. 1	U. S. No. 2	Culls	Total
1930							
A	56.1	33.1	10.8	402,136	237,268	77,417	716,821
B	62.5	28.0	9.5	534,218	239,330	81,201	854,749
C	68.4	24.5	7.1	289,631	103,742	30,064	423,437
D	70.9	25.0	4.1	1,979,502	697,991	114,471	2,791,964
E	45.2	50.4	4.4	1,210,786	1,350,080	117,864	2,678,730
F	51.4	40.5	8.1	2,226,165	1,754,079	350,816	4,331,060
G	49.9	43.1	7.0	3,193,600	2,758,400	448,000	6,400,000
Total	54.3	38.9	6.8	9,836,038	7,140,890	1,219,833	18,196,761
1931							
A	49.3	30.5	20.2	208,778	129,170	85,545	423,493
D	63.8	25.0	11.2	2,400,120	941,837	422,229	3,764,186
E	48.2	32.2	19.6	583,489	389,800	237,269	1,210,558
F	46.7	39.4	13.9	1,276,568	1,078,187	379,263	2,734,018
G	32.2	49.4	18.4	1,297,047	1,988,418	740,781	4,026,246
H	57.7	34.6	7.7	4,161,799	2,493,369	555,206	7,210,374
I	50.8	39.1	10.1	1,945,008	1,496,161	389,631	3,830,800
J	45.1	42.8	12.1	1,722,849	1,631,128	461,159	3,815,136
K	60.2	24.4	15.4	2,113,915	857,621	540,785	3,512,321
L	49.7	38.8	11.5	1,376,704	1,074,226	317,265	2,768,195
M	58.2	23.5	18.3	1,009,109	408,457	316,671	1,734,237
N	62.3	27.8	9.9	391,526	174,898	62,068	628,492
O	44.4	41.2	14.4	127,180	117,924	41,331	286,435
P	46.1	43.8	10.1	106,842	101,365	23,347	231,554
Total	51.7	35.6	12.7	18,720,934	12,882,561	4,572,550	36,176,045

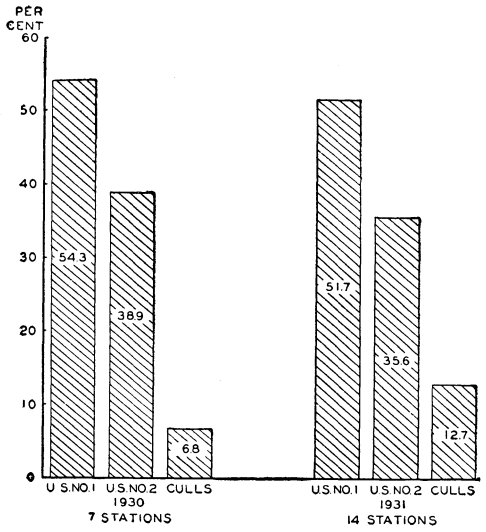

Fig. 4.—Cannery tomatoes inspected in Ohio distribution of grades

Seven plants in 1930 received approximately 4,918 tons of U. S. No. 1 tomatoes, 3,570 tons of U. S. No. 2 tomatoes, and 610 tons of culls. Fourteen plants in 1931 received approximately 9,357 tons of No. 1's, 6,441 tons of No. 2's, and 2,290 tons of culls.

INCREASED RETURNS TO GROWERS

Selling on grade has resulted in larger returns to growers who have sold under this system in Ohio. To illustrate, $114,538.61 were received by growers for tomatoes delivered to these seven stations in 1930, an average of $12.59 per ton. Most Ohio tomato canners in that year paid flat rates of $10.00 to $12.00 per ton. Prices paid by canners employing U. S. grades and government inspection varied from $13.00 to $18.00 per ton for U. S. No. 1's and from $9.00 to $12.00 per ton for U. S. No. 2's. No payment was made for culls. Prices and returns to growers are shown in Table 4.

TABLE 4.—Returns for Cannery Tomatoes Delivered to Seven Stations in Ohio, 1930

Station	Pounds delivered	Contract price per ton to growers		Returns to growers	Usual flat rate	Returns at flat rate
		U. S. No. 1	U. S. No. 2			
A	716,821	$18.00	$12.00	$ 5,042.83	$12.00	$ 4,300.93
B	854,749	18.00	12.00	6,243.94	12.00	5,128.49
C	423,437	13.00	9.00	2,351.34	10.00	2,117.19
D	2,791,964	14.00	10.00	17,332.51	11.00	15,355.80
E	2,678,730	18.00	10.00	17,647.47	12.00	16,072.38
F	4,331,060	16.00	10.00	26,579.72	11.00	23,820.83
G	6,400,000	16.00	10.00	39,340.80	11.00	35,200.00
Total	18,196,761	.....	.....	$114,538.61	.....	$101,995.62

Under this system of grading and at these prices, returns to growers selling to these canners in 1930 were $12,542.99 greater than if the usual flat rates had prevailed, or $1.38 more per ton.

Returns to growers fluctuated in direct relationship with the quality of the tomatoes delivered. Growers who delivered stock containing large percentages of U. S. No. 1 grade and small percentages of U. S. No. 2 grade and culls received a premium, while growers whose deliveries ran heavily to the lower grades were discounted proportionately. To illustrate, 10 loads of tomatoes delivered by as many growers to Plant E in 1930 were selected for comparison. The value per ton was computed at the rates of $18.00 per ton for U. S. No. 1's and $10.00 per ton for U. S. No. 2's. The percentages of each grade in each load were taken directly from the inspection certificates, and the computations were made on a ton basis in order to simplify the comparisons.

TABLE 5.—Value of Cannery Tomatoes per Ton to Ten Ohio Growers, 1930

Grower	U. S. No. 1			U. S. No. 2			Culls		Value per ton to grower
	Pct.	Pounds per ton	Value @ $18 per ton	Pct.	Pounds per ton	Value @ $10 per ton	Pct.	Pounds per ton	
A	94	1880	$16.92	6	120	$0.60	.....	.....	$17.52
B	90	1800	16.20	10	200	1.00	.....	.....	17.20
C	86	1720	15.48	14	280	1.40	.....	.....	16.88
D	56	1120	10.08	41	820	4.10	3	60	14.18
E	45	900	8.10	55	1100	5.50	.....	.....	13.60
F	51	1020	9.18	44	880	4.40	5	100	13.58
G	39	780	7.02	61	1220	6.10	.....	.....	13.12
H	30	600	5.40	64	1280	6.40	6	120	11.80
I	23	460	4.14	37	740	3.70	40	800	7.84
J	7	140	1.26	52	1040	5.20	41	820	6.46

These 10 individuals received prices ranging from $6.46 per ton to $17.52 per ton, depending entirely upon quality. Contract prices in all cases were identical. The extreme range in values between Grower A and Grower J is shown graphically in Figure 5.

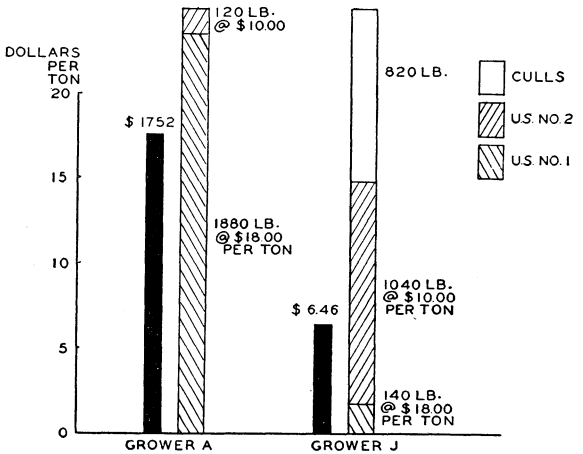

Fig. 5.—Returns to two Ohio growers for graded tomatoes, 1930. High quality brought high returns

Returns to five representative growers who sold to Factory D each year from 1925 to 1930, inclusive, have been compared, in an attempt to determine whether these returns were greater or less when sales were made on the basis of grades. These growers had yields in 1930 ranging from 10.2 tons per acre to 4.84 tons per acre. In examining Table 6 it should be kept in mind that in 1930 tomatoes were sold on grade at $14 per ton for U. S. No. 1's and $10 per ton for U. S. No. 2's; in the previous 5 years a flat rate of $11 per ton prevailed.

TABLE 6.—Returns to Five Growers, 1925-1930

	Growers					
	A	B	C	D	E	All 5 growers
Acres, 1930	3	4	1.5	2	3	13.5
Acres, Av. 1925-1929	3.9	3.5	1.6	2.2	4.6	15.8
Tons produced, 1930	30.59	37.41	9.71	12.65	14.51	104.87
Tons produced, Av. 1925-1929	17.88	27.43	11.40	12.75	26.05	95.52
Tons per acre, 1930	10.20	9.35	6.47	6.33	4.84	7.77
Tons per acre, Av. 1925-1929	4.59	7.84	7.13	5.79	5.67	6.05
Gross returns, 1930	$390.59	$466.59	$116.47	$156.42	$175.42	$1305.49
Gross returns, Av. 1925-1929	$205.40	$308.54	$127.72	$143.85	$296.29	$1081.80
Gross returns per acre, 1930	$130.29	$116.65	$ 77.64	$ 78.21	$ 58.47	$ 96.70
Gross returns per acre, Av. 1925-1929	$ 52.67	$ 88.15	$ 79.82	$ 65.39	$ 64.41	$ 68.46
Gain or loss per acre, 1930	+$ 77.62	+$ 28.50	−$ 2.18	+$ 12.82	−$ 5.94	+$ 28.24
Gross returns per ton, 1930	$ 12.77	$ 12.47	$ 11.99	$ 12.37	$ 12.09	$ 12.45
Gross returns per ton, Av. 1925-1929	$ 11.49	$ 11.25	$ 11.20	$ 11.28	$ 11.37	$ 11.33
Gain or loss per ton, 1930	+$ 1.28	+$ 1.22	+$ 0.79	+$ 1.09	+$ 0.72	+$ 1.12

In each instance these growers received larger returns per ton in 1930 on the grading system than during the 5 years 1925 to 1929 when the flat rate prevailed. These five growers gained an average of $1.12 per ton. Three received larger returns per acre, and the average gain of the five was $28.24 per acre.

Whether these higher returns necessitated some sacrifice of tonnage and increased labor costs is not known.

INCREASED VALUE TO CANNERS

The increased value to canners of tomatoes bought on grade may be illustrated by comparing the yields and computed values of the finished products manufactured from each ton of raw stock. Data for this comparison have been furnished by four companies operating five factories in Ohio, who bought on grade in 1930. Yields per ton in 1930 have been compared with the average yield per ton in the 5 years 1925 to 1929, inclusive, when tomatoes were bought by these companies on the flat rate system.

TABLE 7.—Yields of Tomato Products in Five Ohio Factories, 1925-1930

Five factories combined	Total 1925-1929 (Net wt.)	1930 (Net wt.)	Total 1925-1929 (Raw stock)	1930 (Raw stock)
	Lb.	*Lb.*	*Pct.*	*Pct.*
Tomatoes received	28,531,800	12,139,060	100	100
Canned tomatoes packed; Fancy	1,476,105	416,685	5.2	3.4
Canned tomatoes packed; Ex. Std.	5,080,320	3,338,835	17.8	27.5
Canned tomatoes packed; Std.	1,417,095	477,030	5.0	3.9
Other tomato products packed	5,625,993	2,228,575	19.7	18.4
Waste	14,932,287	5,677,935	52.3	46.8

Expressed in percentages of total pack rather than in terms of raw stock purchased, the products manufactured in 1925 to 1929 were proportioned as follows: Fancy tomatoes, 10.8 per cent; Extra Standard tomatoes, 37.4 per cent; Standard tomatoes, 10.4 per cent; other products, 41.4 per cent. In 1930 proportions were: Fancy tomatoes, 6.4 per cent; Extra Standard tomatoes, 51.7 per cent; Standard tomatoes, 7.4 per cent; other products, 34.5 per cent.

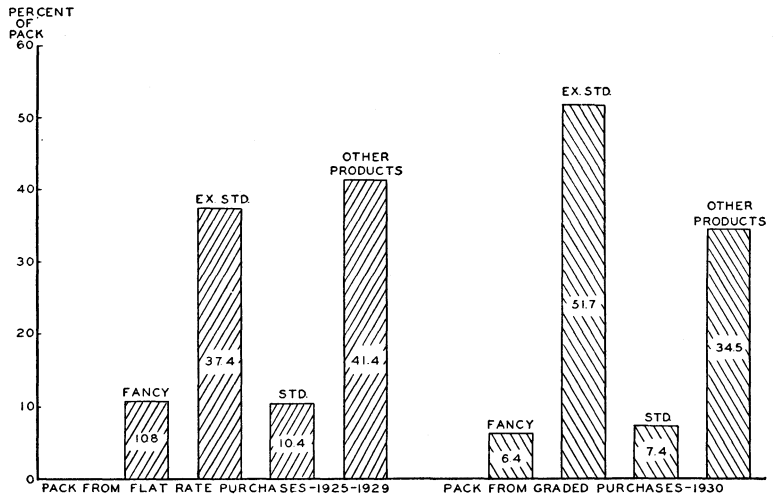

Fig. 6.—Canned tomatoes and other tomato products packed in five Ohio factories from graded and ungraded raw stock (in terms of per cent of total pack). Improved quality in finished products accompanied purchase on grades.

Fancy and Extra Standard tomatoes rose in 1930 from 48.2 per cent to 58.1 per cent, Standard tomatoes declined from 10.4 per cent to 7.4 per cent, and other products declined from 41.4 per cent to 34.5 per cent. The pack improved noticeably in quality.

The gross sales values of these products have been computed at the 5-year average price level of 1926 to 1930, using prices enumerated in Table 14, Page 23. To simplify the comparison, yields have been expressed in terms of No. 2 cans canned tomatoes and No. 10 cans pulp.

It will be observed that the computed gross sales value of the finished products manufactured from each ton of raw stock rose from $53.63 on the flat rate system to $61.49 on the graded system, a gain of $7.86.

TABLE 8.—Values of Tomato Products per Ton of Raw Stock in Five Ohio Factories, 1925-1930

Five factories combined	Av. 1925-1929 (Net wt.)	1930 (Net wt.)	Av. 1925-1929 Doz. cans	1930 Doz. cans	Price per doz.	Value per ton	
						Av. 1925-1929	1930
	Lb.	*Lb.*			*Dol.*	*Dol.*	*Dol.*
Tomatoes received	2000	2000	.....	.....	.....	.....	.....
Canned tomatoes packed; Fancy*	104	68	6.93	4.53	1.18	8.18	5.35
Canned tomatoes packed; Ex. Std.*	356	550	23.73	36.67	1.01	23.97	37.03
Canned tomatoes packed; Std.*	100	78	6.67	5.20	.91	6.07	4.73
Other tomato products packed†	394	368	4.80	4.48	3.21	15.41	14.38
Totals	.....	.....	.....	.....	.....	53.63	61.49

*Expressed in terms of No. 2 cans.
†Expressed in terms of pulp in No. 10 cans.

It has been seen that raw stock costs increased $1.38 per ton. Inspection charges at $50 per week per man totalled $2,854.85 in 1930 and $5,500.00 in 1931, or $0.31 per ton. Can requirements per ton under the graded system were larger than under the flat rate system; at the 5-year average quotations, f. o. b. factory, during 1926 to 1930 of $20.99 per thousand No. 2 cans and $63.11 per thousand No. 10 cans, this increased can cost amounted to $2.04 per ton.

Based on labor costs reported by three of these companies operating four factories, savings in labor costs in manufacturing graded tomatoes rather than ungraded amounted to $0.28 per ton. Labor costs in these factories averaged $7.29 per ton during 1925 to 1929, inclusive, and $7.01 per ton in 1930. Wage rates in these factories had not changed materially in 1930 from the average of those prevailing during the preceding 5 years.

Net costs were thus $3.45 more per ton than when these canners were buying on flat rates. Deducting this amount from the gross increase of $7.86 in sales value of the finished products results in a net gain to the canner of $4.41 per ton of raw stock purchased.

A more reliable comparison can be made, of course, after a longer experience with the grading system. The evidence thus far obtained tends to indicate that the marketing of cannery tomatoes on grade and inspection results in (a) greater returns to growers, (b) lower labor costs and higher net returns to canners, (c) improved quality and larger volume of finished products per ton of raw stock, and (d) more equitable relationships between growers and canners.

PRICE DIFFERENTIALS OR SPREADS

Contract prices per ton to growers lack uniformity. As shown in Table 9, not only did prices paid for a given grade vary widely both in 1930 and in 1931, but differentials, or spreads between prices paid for U. S. No. 1 and U. S. No. 2 tomatoes, were not constant.

TABLE 9.—Contract Prices Paid by Ohio Canners for Graded Tomatoes, 1930 and 1931

Station	Year	Contract price per ton		Differential
		U.S. No. 1	U.S. No. 2	
		Dol.	*Dol.*	*Dol.*
A	1930	18.00	12.00	6.00
B	1930	18.00	12.00	6.00
C	1930	13.00	9.00	4.00
D	1930	14.00	10.00	4.00
E	1930	18.00	10.00	8.00
F	1930	16.00	10.00	6.00
G	1930	16.00	10.00	6.00
A	1931	16.00	10.00	6.00
D	1931	13.00	6.00	7.00
E	1931	15.00	8.00	7.00
F	1931	14.00	7.00	7.00
G	1931	14.00	6.00	8.00
H	1931	11.00*	11.00*	.....
I	1931	13.00	7.00	6.00
J	1931	14.00	6.00	8.00
K	1931	13.00	7.00	6.00
L	1931	14.00	7.00	7.00
M	1931	13.00	7.00	6.00
N	1931	14.00	7.00	7.00
O	1931	14.00	7.00	7.00
P	1931	15.00	12.00	3.00
Average, exclusive of Station H, 1931	.....	14.75	8.50	6.25

*Flat rate, nothing for culls. Grades were determined by inspection, but contracts had already been signed on a flat rate basis when the canner decided to use inspection.

It will be noted that at Station A the differential was $6 both in 1930 and in 1931, at Station D it rose from $4 in 1930 to $7 in 1931, at Station E it declined from $8 in 1930 to $7 in 1931, at Station F it rose from $6 in 1930 to $7 in 1931, and at Station G it rose from $6 in 1930 to $8 in 1931.

Proper relationship between prices for U. S. No. 1 grade and U. S. No. 2 grade doubtless depends to a degree upon the nature and sales value of the products manufactured; yet these fluctuating differentials indicate that growers and canners are not yet sufficiently informed about the relative value of No. 1's and No. 2's to permit the establishment of an equitable differential.

In an effort to obtain some of this needed information a series of experiments was conducted at Factory D in 1931 by the Ohio Agricultural Experiment Station. These experiments were

designed to determine the relative value to the canner of the two acceptable grades of tomatoes, in terms of both quantity and quality packed from each grade.

To secure a supply of each grade of tomatoes large enough to be handled through the plant separately under usual commercial conditions, the inspector's samples were held after sorting and allowed to accumulate for a few hours. Each lot, consisting of one grade only, was then run through the plant in the usual manner, care being used to avoid mingling of lots. Trimming and peeling tables and packing equipment were cleared before and after running each lot. The experiment was conducted first on September 10th and repeated on September 11th and 15th, 1931, a total of 4,857 pounds of tomatoes, exclusive of culls, being used in the three runs. Results of the three separate runs have been consolidated in the following tabulations.

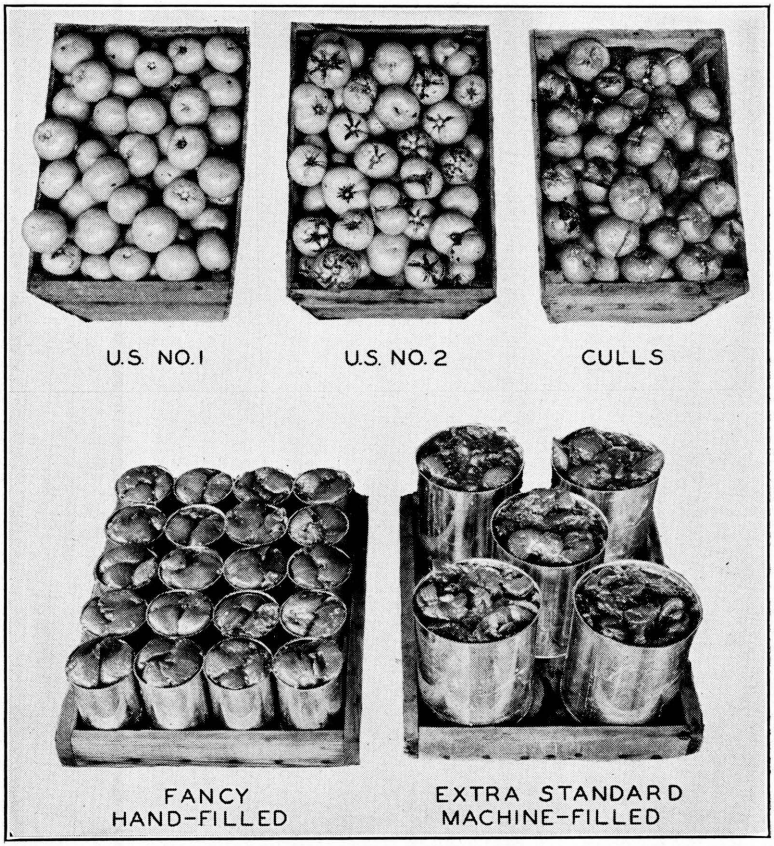

Fig. 7.—Grades of raw and canned tomatoes

Grading of the samples by the inspector resulted as shown in Table 10.

TABLE 10.—Inspector's Samples of Cannery Tomatoes Used in Grading Experiments, 1931

Experiment No.	Date	U. S. No. 1	U. S. No. 2	Culls	Total
		Lb.	*Lb.*	*Lb.*	*Lb.*
1	Sept. 10	803	427	188	1418
2	Sept. 11	949	641	334	1924
3	Sept. 15	1486	551	157	2194
Total		3238	1619	679	5536
Per cent of total		59	29	12	100

Lot No. 1 (U. S. No. 1) packed out as follows:

TABLE 11.—Results of Experimental Packing of U. S. No. 1 Tomatoes, 1931

	Sept. 10	Sept. 11	Sept. 15	Total
U. S. No. 1 tomatoes (lb.)	803	949	1486	3238
No. 1 cans hand-packed tomatoes	.....	.....	246	246
No. 2½ cans hand-packed tomatoes	81	.....	.....	81
No. 3 cans hand-packed tomatoes	.....	46	.....	46
No. 3 cans machine-packed tomatoes	141	162	.....	303
No. 10 cans machine-packed tomatoes	.....	.....	95	95
Net wt. hand-packed tomatoes (lb.)*	147	99	162	408
Net wt. machine-packed tomatoes (lb.)*	304	349	635	1288
Total net wt. canned tomatoes (lb.)	451	448	797	1696
Total net wt. other tomato products from pulp stock (lb.)†	71	88	129	288
Total net wt. waste (lb.)	281	413	560	1254
Percentage canned tomatoes	56.2	47.2	53.6	52.4
Percentage other tomato products	8.8	9.3	8.7	8.9
Percentage waste	35.0	43.5	37.7	38.7

*Net weights computed as follows: No. 1 cans, 10½ oz.; No. 2½ cans, 1 lb. 13 oz.; No. 3 cans, 2 lb. 2½ oz.; No. 10 cans, 6 lb. 11 oz.

†The actual yield from pulp stock was not recorded in these experiments but was computed as 40 per cent of the weight of the pulp stock derived from peeling, which was recorded. This computation is based upon the fact that yields of catsup in this factory have averaged approximately 40 per cent of the weight of the pulp stock.

Lot No. 2 (U. S. No. 2) packed out as follows:

TABLE 12.—Results of Experimental Packing of U. S. No. 2 Tomatoes, 1931

	Sept. 10	Sept. 11	Sept. 15	Total
U. S. No. 2 tomatoes (lb.)	427	641	551	1619
No. 1 cans hand-packed tomatoes	.....	.....	10	10
No. 2½ cans hand-packed tomatoes	3	.....	.....	3
No. 3 cans hand-packed tomatoes	.....	7	.....	7
No. 3 cans machine-packed tomatoes	84	148	.....	232
No. 10 cans machine-packed tomatoes	.....	.....	41	41
Net wt. hand-packed tomatoes (lb.)*	5	15	7	27
Net wt. machine-packed tomatoes (lb.)*	182	319	274	775
Total net wt. canned tomatoes (lb.)	187	334	281	802
Total net wt. other tomato products from pulp stock (lb.)†	42	72	60	174
Total net wt. waste (lb.)	198	235	210	643
Percentage canned tomatoes	43.8	52.1	51.0	49.5
Percentage other tomato products	9.8	11.2	10.9	10.7
Percentage waste	46.4	36.7	38.1	39.8

*See footnote Table 11.
†See footnote Table 11.

Whole tomatoes of good color were selected from the trimmed and peeled raw stock and cans were hand-filled. The remainder were machine-filled. Pulp stock was converted into catsup. Although the percentage of canned tomatoes packed from the U. S. No. 1 lot was only slightly greater than from the U. S. No. 2 lot, the proportion packed by hand was much larger in the No. 1's than in the No. 2's. In the No. 1 lot, 12.6 per cent of the original weight of the raw stock was selected for hand-filling; whereas, in the No. 2 lot, only 1.7 per cent of the original weight was suitable for this grade. In the No. 1 lot, 39.8 per cent was machine-packed, as compared with 47.9 per cent in the No. 2 lot.

Sample cans from each lot were selected at random after sealing and were forwarded to the Bureau of Agricultural Economics at Washington, D. C., for scoring by the Canned Foods Grading Service. The standards for canned tomatoes provided by the amendment of July 8, 1930 to the Federal food and drugs act set forth definite requirements for color, flavor, freedom from peelings and blemishes, and the quantity of solid tomatoes in the can. Scores were reported as shown in the following score sheet summary.

Quality of the tomatoes packed from U. S. No. 1 tomatoes obviously exceeded that of the tomatoes packed from the No. 2 grade. The combined score of the samples packed from No. 1's exceeded by 4 points the combined score of those packed from No. 2's. The tomatoes packed by hand from U. S. No. 1's met the

requirements of United States Grade "A" (Fancy). Others failed to meet these standards and were all designated as United States Grade "B" (Extra Standard).

TABLE 13.—Scores of Sample Cans from Experimental Lots of Tomatoes, September 26, 1931

	Hand-packed from U. S. No. 1 tomatoes	Hand-packed from U. S. No. 2 tomatoes	Machine-packed from U. S. No. 1 tomatoes	Machine-packed from U. S. No. 2 tomatoes
I. Percentage of whole tomatoes	*Score** 17	*Score** 18	*Score** 16	*Score** 17
II. Solidity	20	20	18	20
III. Color	20	17	17	17
IV. Absence of defects	19	19	19	18
V. Flavor	19	17	18	16
Total score	95 U. S. Grade "A"	91 U. S. Grade "B"†	88 U. S. Grade "B"	88 U. S. Grade "B"

*Points attained. 20 points highest attainable under each factor.
†Account 2 factors below 18.

It is worth noting that no "Standard" or sub-standard tomatoes were packed from either grade. In this connection it should be kept in mind that all culls were removed from these experimental lots and were discarded before the test runs were started. Good quality in the raw stock was reflected in good quality in the finished products.

The relationship in value between the two grades of raw stock used in these experiments may be calculated by applying to any given quantity (say one ton) of tomatoes of each grade the appropriate percentages of yield of canned tomatoes and other products and an average price for each grade in the pack. A wholly satisfactory price variation is not available because there are no published or established markets on all grades. The following prices, however, may be considered as fairly representative of the price spread existing between the various grades during the given years 1926 to 1930, inclusive. These prices were furnished by a leading canner of tomatoes, a leading packer of pulp, and a broker in Ohio; they represent their opinions of approximate average prices, f. o. b. Ohio factories, during that period. Although many sales doubtless were made at levels both higher and lower than these figures, nevertheless these quotations provide a representative variable suitable for the present purpose.

TABLE 14.—Prices of Canned Tomatoes and Other Tomato Products, f. o. b. Ohio Factory, 1926-1930

Product	Prices per dozen					
	1926	1927	1928	1929	1930	5-year average
No. 2 cans Fancy canned tomatoes	$1.20	$1.15	$1.15	$1.20	$1.20	$1.18
No. 2 cans Extra Standard canned tomatoes	1.05	1.00	0.975	1.00	1.00	1.01
No. 2 cans Standard canned tomatoes	0.95	0.90	0.875	0.90	0.90	0.91
8 oz. bottles catsup	1.00	1.00	1.00	0.90	0.75	0.93
10½ oz. bottles catsup	1.10	1.10	1.10	1.00	0.85	1.03
14½ oz. bottles catsup	1.45	1.45	1.45	1.35	1.10	1.36
No. 10 cans catsup	6.00	6.00	6.00	6.00	5.25	5.85
Gallons glass catsup	9.00	9.50	8.50	9.00	8.00	8.80
8 oz. bottles chili sauce	1.35	1.35	1.35	1.25	1.25	1.31
12 oz. bottles chili sauce	2.00	2.00	2.00	1.75	1.60	1.87
No. 10 cans pulp	3.125	3.125	3.425	3.625	2.75	3.21

Relative values of the products packed from the two grades of raw stock may now be computed. To facilitate comparison calculations have been made on the basis of one ton of tomatoes of each grade.

TABLE 15.—Relative Yields and Values of U. S. No. 1 and U. S. No. 2 Tomatoes, Based on 1931 Experiments

	U. S. No. 1	U. S. No. 2
Raw stock	2000 lb.	2000 lb.
Pct. U. S. Grade A (Fancy)	12.6	.....
Pct. U. S. Grade B (Extra Standard)	39.8	49.6
Pct. Pulp	8.9	10.7
Net wt. U. S. Grade A (Fancy)	252 lb.	.....
Net wt. U. S. Grade B (Extra Standard)	796 lb.	992 lb.
Net wt. Pulp	178 lb.	214 lb.
No. 2 cans U. S. Grade A (Fancy)*	196.20	.....
No. 2 cans U. S. Grade B (Extra Standard)*	619.75	772.36
No. 10 cans Pulp†	26.03	31.29
5-yr. average price Fancy‡	$ 1.18	$ 1.18
5-yr. average price Extra Standard‡	1.01	1.01
5-yr. average price Pulp‡	3.21	3.21
Gross sales value of products per ton of raw stock	$78.41	$73.38

*@ 20.55 oz. per No. 2 can.
†@ 109.43 oz. per No. 10 can.
‡Per doz. No. 2 cans Fancy and Extra Standard and per doz. No. 10 cans Pulp. (See Table 14).

Under the conditions set forth in Table 15, the products packed from one ton of U. S. No. 1 tomatoes exceeded in value those packed from one ton of U. S. No. 2 tomatoes by $5.03. This difference is almost entirely traceable to the difference in quality of the raw stock. Some small economies in labor, that were not measured, and a slight increase in can costs in packing U. S. No. 1 tomatoes might change this differential somewhat; yet it could not depart material-

ly from the amount stated. In other words, the canner, in order to make approximately the same margin on both grades, would have had to purchase U. S. No. 2 tomatoes from the grower for approximately $5.00 per ton less than U. S. No. 1 grade.

It should be kept in mind that tomato products other than canned tomatoes are included in the foregoing calculations. Some canners do not pack other products. Others do not pack canned tomatoes. The canner's returns, the price he can afford to pay for raw stock, and the price differential between grades are influenced by these considerations, as well as by prices of the finished products. Consequently, no attempt is made here to determine a fixed differential. It is not likely that any one differential can be established that would be equally satisfactory and equitable for all canners and under all conditions.

In general it appears, however, that the spreads between prices paid for the two grades by most tomato canners in Ohio in 1930 and 1931 have been greater than justified by conditions prevailing in those years. There does not seem to have been that much difference in value between the two grades, although if canners prefer to accept no U. S. No. 2 tomatoes and to encourage production and harvesting of larger percentages of U. S. No. 1 stock, they may desire to establish wide spreads.

Additional experimental data may not confirm exactly the results obtained in the tests described herein. The reliability of the data can be increased by further experiments over a number of years and in various factories. Further research bearing upon this problem therefore is desirable.

WASTAGE IN PACKING PROCESSES

The amount of waste in the processing of tomatoes is large, and, in the experiments described herein, amounted to almost one-half of the weight of the raw stock purchased by the canner.

Much of this waste was unavoidable. It will be noted in Figure 8 that, even with tomatoes of U. S. No. 1 grade, only 52 per cent of the gross weight was finally packed as canned tomatoes. An additional 9 per cent appeared as other products from pulp stock. The remaining 39 per cent was waste. With U. S. No. 2 tomatoes the amount packed as canned tomatoes was 49 per cent and as other products 11 per cent; the remaining 40 per cent was waste. It is noticeable that only a slight difference appeared in the waste from the two grades; differences in value to the canner resulted mainly from the different quality of the pack.

In the experimental lot of 5,536 pounds, 47 per cent of the gross weight purchased by the canner was waste, 45 per cent was packed as canned tomatoes, and 8 per cent as other products. Part of this loss could have been eliminated through greater care in harvesting and handling.

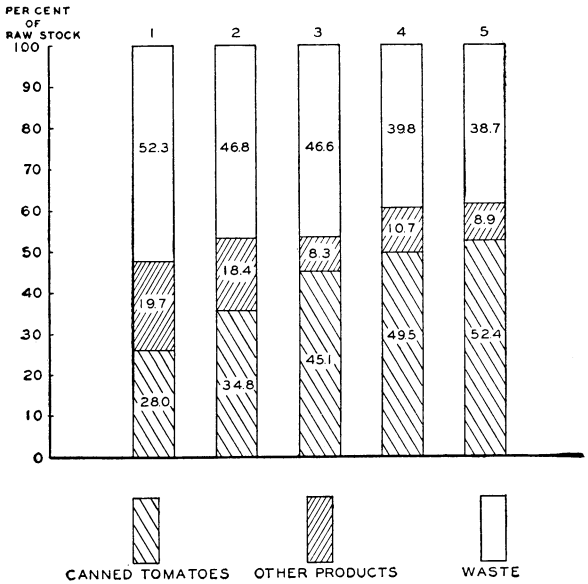

Fig. 8.—Utilization of cannery tomatoes. Grading reduced waste and increased yields.

1. **Five Ohio canneries (Av. 1925-1929) flat rate—Total pack.**
2. **Five Ohio canneries (1930) graded—Total pack.**
3. **Cannery "D" (1931) all grades—Experimental lot only.**
4. **Cannery "D" (1931) U. S. No. 2 tomatoes—Experimental lot only.**
5. **Cannery "D" (1931) U. S. No. 1 tomatoes—Experimental lot only.**

Although cull tomatoes cannot be completely eliminated under commercial conditions, the amount may be reduced. Immature or decayed tomatoes may be left in the field. Crushed tomatoes may be avoided by careful handling and loading; over-filled containers were responsible for a large part of the crushed tomatoes culled out of these experimental lots. Yet grading brought about substantial improvement over conditions prevailing under the flat rate system. Compare Bars No. 2 and No. 3 with Bar No. 1 in Figure 8. Waste was much less, and the percentage packed as canned tomatoes was larger.

Deterioration of ripe tomatoes takes place rapidly. Delays in processing after the stock is delivered to the canning plant result both in losses of weight and in decline in quality. Two experimental lots of red ripe Stone tomatoes, selected at random as inspectors' samples from loads delivered to Factory D, were accumulated and held for various periods of time to determine what changes, if any, would occur in weight and grade.

The first of these lots, consisting of approximately one ton of tomatoes, was inspected and sorted between 2:30 and 5:30 P. M., September 9, 1931. This lot consisted of about 1700 pounds of U. S. No. 1, 200 pounds of U. S. No. 2, and 100 pounds of culls. Each grade was held separately over night on a covered platform. The weather was clear, with a mean temperature of 76 degrees F. At 7:00 A. M., September 10th, the No. 1's and No. 2's were sampled with the following results:

	Lot U. S. No. 1	Lot U. S. No. 2	Culls
Wt. of sample	123 lb.	71 lb.	Not sampled
U. S. No. 1	85 lb.–69%	3 lb.– 4%	
U. S. No. 2	17 lb.–14%	46 lb.–65%	
Culls	21 lb.–17%	22 lb.–31%	

Actual weights were not recorded; therefore, shrinkage in weight after approximately 15 hours is unknown. Material deterioration in grading resulting from this delay was apparent. It will be noted that tomatoes that graded U. S. No. 1 in the afternoon of September 9th contained 14 per cent U. S. No. 2's and 17 per cent culls the following morning. Likewise, tomatoes grading U. S. No. 2 on September 9th contained 31 per cent culls 15 hours later. The small amount of U. S. No. 1's found in this sample resulted from the ripening of tomatoes not quite mature enough to be graded U. S. No. 1 on the previous afternoon.

This experiment was repeated a few days later. In the afternoon of September 14th a total of 1983 pounds of tomatoes was accumulated from the inspectors' samples and was held separately by grades as before. Of these, 1160 pounds were U. S. No. 1, 579 pounds U. S. No. 2, and 244 pounds culls. At 7:30 A. M., September 15th, approximately 16 hours later, each lot was weighed and sampled. The following weights were recorded:

	Original weights	Weights after 16 hours	Shrinkage	
	Lb.	*Lb.*	*Lb.*	*Pct.*
Lot No. 1 (U. S. No. 1)	1160	1146	14	1.2
Lot No. 2 (U. S. No. 2)	579	562	17	3.0
Lot No. 3 (Culls)	244	216	28	11.5
Total	1983	1924	59	3.0

Grading of the samples from Lot U. S. No. 1 and Lot U. S. No. 2 after 16 hours resulted as follows:

	Lot U. S. No. 1	Lot U. S. No. 2	Culls
Wt. of sample	80 lb.	77 lb.	Not sampled
U. S. No. 1	60 lb.–75%	5 lb.– 6%	
U. S. No. 2	14 lb.–18%	50 lb.–65%	
Culls	6 lb.– 7%	22 lb.–29%	

At 6:30 A. M., September 16th, approximately 39 hours after the original sampling, each lot was again weighed and the U. S. No. 1 and U. S. No. 2 lots were again sampled. The following weights were recorded:

	Original weights	Weights after 39 hours	Shrinkage	
	Lb.	*Lb.*	*Lb.*	*Pct.*
Lot No. 1 (U. S. No. 1)	1160	1138	22	1.9
Lot No. 2 (U. S. No. 2)	579	558	21	3.5
Lot No. 3 (Culls)	244	179	65	26.6
Total	1983	1875	108	5.5

Grading of the samples from Lot U. S. No. 1 and U. S. No. 2 after 39 hours resulted as follows:

	Lot U. S. No. 1	Lot U. S. No. 2	Culls
Wt. of sample	77 lb.	73 lb.	Not sampled
U. S. No. 1	26 lb.–34%	.....	
U. S. No. 2	18 lb.–23%	27 lb.–37%	
Culls	33 lb.–43%	46 lb.–63%	

The weather during this second test was cloudy, with slight rainfall each day ranging from .02 to .38 of an inch. Mean temperatures were as follows: September 14, 75 degrees F.; September 15, 75 degrees F.; and September 16, 76 degrees F.

The tomatoes used in this experiment lost 3 per cent in weight in 16 hours and 5.5 per cent in 39 hours. This is equivalent to 110 pounds per ton. As expected, the U. S. No. 1 tomatoes shrunk less in weight than other grades.

The U. S. No. 1 lot, after 16 hours, contained only 75 per cent U. S. No. 1 tomatoes and, after 39 hours, only 34 per cent. Culls increased from 13 per cent at the time of the original sampling on September 14th to 24 per cent 16 hours later and to 54 per cent 39 hours later. The entire experimental lot after 39 hours was almost wholly unfit for use and was dumped.

Delays in handling were costly. Under the conditions described, storage of red ripe tomatoes in delivery yards or on factory platforms for periods of a day or more resulted in serious depreciation in quality and considerable shrinkage in weight. It appears that harvesting and delivery to the plant should be so scheduled as to conform as closely as possible with manufacturing operations. Purchase of tomatoes on grade may result in deliveries of high quality raw stock to the factory, but, unless accompanied by prompt processing, this method of buying cannot assure quality in the finished product or profit to the canner.

SUMMARY

1. The manufacture of canned tomatoes and tomato products is an important industry in Ohio.

2. Until recently Ohio canners have purchased raw stock from growers at agreed flat rates per ton.

3. Purchase of raw stock on U. S. grades and government inspection is displacing the flat rate system. In 1930 five tomato packers in Ohio, operating six factories and one receiving station, bought 9,098 tons on grade; and in 1931 twelve packers, operating fourteen factories, bought 18,088 tons on grade.

4. Tomatoes inspected in 1930 graded 54.3 per cent U. S. No. 1, 38.9 per cent U. S. No. 2, and 6.8 per cent culls. In 1931 the inspected tomatoes graded 51.7 per cent U. S. No. 1, 35.6 per cent U. S. No. 2, and 12.7 per cent culls. Growing conditions were less favorable in 1931 than in 1930.

5. Selling on grade has resulted in larger returns to growers. In 1930 growers received $1.38 more per ton than they would have if the usual flat rate had prevailed.

6. Returns to growers were proportionate to quality delivered.

7. Canners paid $0.31 per ton for inspection.

8. Graded tomatoes in five factories in 1930 yielded 34.8 per cent canned tomatoes, 18.4 per cent other products, and 46.8 per cent waste. This represented an improvement over the average of the 5 years 1925 to 1929, inclusive, in these same factories, when the yield was 28.0 per cent canned tomatoes, 19.7 per cent other products, and 52.3 per cent waste.

9. The pack in five factories using grades in 1930 was higher in quality than the average of 1925 to 1929, inclusive, in these same factories. Fancy and Extra Standard canned tomatoes increased from 48.2 per cent of the total pack to 58.1 per cent, while Standard tomatoes declined from 10.4 per cent to 7.4 per cent, and other products from 41.4 per cent to 34.5 per cent.

10. Computed gross sales value of the tomato products manufactured in five Ohio canneries when raw stock was purchased on grade was $7.86 more per ton of raw stock than when tomatoes were bought on flat rates.

11. In these five factories the following costs were higher on the graded basis than on the flat rate basis: raw stock, $1.38 per ton more; inspection, $0.31 per ton more; cans, $2.04 per ton more.

Labor costs were $0.28 per ton less. Net costs were thus $3.45 more per ton than when these canners were buying on flat rates. Deducting this amount from the gross increase in sales value of $7.86 per ton results in a net gain of $4.41 per ton to the canner.

12. Contract prices to growers for graded tomatoes lack uniformity.

13. Experimental work in 1931 indicated that the pack from one ton of U. S. No. 1 tomatoes was worth about $5.00 more than the pack from one ton of U. S. No. 2 tomatoes.

14. No "Standard" or sub-standard tomatoes were packed from either grade.

15. The amount of waste in the processing of tomatoes is large, and in the experiments described herein amounted to almost one-half of the weight of the raw stock purchased by the canner.

16. Much of this waste was unavoidable. Even in U. S. No. 1 tomatoes, more than one-third of the weight was lost in processing.

17. Delays in handling were costly. Tomatoes held for a day and a half after delivery to the factory shrunk 5.5 per cent in weight and declined in grade so seriously as to be almost wholly unfit for use.

18. Purchase on grade may result in deliveries of high quality raw stock to the factory and increased returns to growers, but, unless accompanied by prompt processing, this method of buying cannot assure quality in the finished product or profit to the canner.

19. The evidence thus far obtained tends to indicate that the marketing of cannery tomatoes on grade and inspection results in: (a) greater returns to growers; (b) lower labor costs and higher net returns to canners; (c) improved quality and larger volume of finished products per ton of raw stock; and (d) more equitable relationships between growers and canners.